An assembly and method for performing parallel chemical experiments, in particular crystallisation experiments.

The present invention relates to an assembly for performing parallel chemical experiments, in particular crystallisation experiments. The present invention also relates to systems comprising such an assembly as well as methods wherein the assembly is used.

An assembly as well as systems and methods for performing parallel crystallisation experiments are known from WO 02/06802. The known assembly comprises a microplate having multiple microwells having an opening at the top. Sealing of the wells is effected by O-ring seals around the top of each well, which are interpositioned between the microplate and a cover plate.

The known assembly is not sufficiently practical when conducting parallel experiments in high volumes, known as high throughput experimentation. In particular the known assembly is unsatisfactory when conducting parallel crystallisation experiments.

An object of the present invention is to provide an improved experimentation assembly, in particular for use in crystallisation experiments.

The present invention provides an assembly for performing parallel chemical experiments, in particular crystallisation experiments, said assembly comprising:

- a main body having a first and a second face on opposite sides thereof, multiple bores extending through said main body between said first and second face,
- tubular liners having openings at opposite ends thereof, each liner removably fitting in a bore in the main body,
- first closure means for closing the openings of the liners at the first face of the main body,
- second closure means for closing the openings of the liners at the second face of the main body,

- said first and second closure means being attachable to said main body, so that an experimentation chamber is defined within each liner.

The assembly according to the invention allows for the use of tubular liners which are simple to manufacture and also can be cleaned easily prior and/or after the experiment or be simply discarded after use. Also the main body allows for an efficient cleaning of the bores, which is particularly relevant in the field of crystallisation experiments where any contamination is likely to affect the outcome of the experiment.

The present invention also relates to systems comprising the assembly of the invention and methods wherein said assembly is used.

The assembly or system according to the invention can be adavantageously ised for solid form screening of molecules, e.g. salt screening, polymorph screening, enantiomer separation screening, in particular of active pharmaceutical ingredients.

The invention and and preferred embodiments thereof are described in the claims and the following description referring to the drawings. In the drawings:

Fig. 1 shows in cross-section a part of an experimentation assembly according to the present invention,

Fig. 2 shows an embodiment of the first and/or second sealing members of the assembly of figure 1,

Fig. 3. shows a part of a filtration device to be used in combination with the experimentation assembly of the invention,

Fig. 4 shows a collecting device, and

Fig. 5 shows a vapour discharge assembly.

In figure 1 a part of an experimentation assembly 1 for performing parallel chemical experiments, in particular crystallisation experiments, is shown.

The assembly 1 comprises a main body 2 having a first face 3 and a second face 4 on opposite sides thereof and multiple bores 5 extending through said main body 2 between said first face 3 and second face 4.

In the figure 1 only one bore 5 is visible. In practice the number of bores vary depending on the application. Preferably the assembly 1 has at least four bores.

In each of the bores 5 a removable tubular liner 6 is arranged. Each liner 6 has openings 7, 8 at opposite ends thereof. Each liner 6 is removably fitted in a corresponding bore 5 in the main body 2.

The assembly 1 further comprises first closure means 10 for closing the openings 7 of the liners 6 at the first face 3 of the main body 2. Also the assembly comprises second closure means 15 for closing the openings 8 of the liners 6 at the second face 4 of the main body 2.

Said first and second closure means 10, 15 are fixed with respect to said main body 2 using suitable fastening means such as bolts 23, so that an experimentation chamber 20 is defined within each liner 5 which is closed of at its ends as will be explained below.

The first closure means 10 comprise in the embodiment shown here multiple elastic first sealing members 11, corresponding to the nnumber of bores 5, and a first cover plate 12 extending over all the bores 5, so that said first sealing members 11 are interpositioned between the ends of the tubular liners 6 and the first cover plate 12.

The second closure means 15 comprise in the embodiment shown here multiple second elastic sealing members 16 and a second cover plate 17, so that said second sealing members 16 are interpositioned between the ends of the tubular liners 6 and the second cover plate 17.

The first and second sealing members 11,16 are embodied here as a sealing disc or disc shaped septum, which can be pierced by a hollow needle.

The first and second cover plates 11, 17 are each provided with bores 13, 18 extending in line with the bores 5 in the main

body 2, in particular the bore in the liners 6. As the first and second sealing members 11, 16 are pierceable, a needle can be inserted into each experimentation chamber 20 e.g. for purposes explained below.

The tubular liner 6 is provided with an outwardly directed support projection in the form a circumferential support flange 9 at one end of the tubular liner 6. The main body 2 is at the first face 3 provided with an annular recess for receiving said support flange 9 as well as the sealing member 11.

In an embodiment not shown in the drawing the first and/or second sealing members 11, 16 comprise a filter for filtering the contents of the experimentation chamber upon removal of said contents. In a practical embodiment thereof, shown in figure 2, the first and/or second sealing members comprise an annular seal 20, such as an O-ring, and a filter 21, such as a mesh or sheet, extending across the central opening of said seal 20.

Preferably the main body 2 is a solid block, e.g. of stainless steel, brass, hasteloy.

Preferably the main body 2 is made of a heat conducting material, e.g. a metal, and the liners 6 are in contact with said main body essentially over their entire outer surface so that an optimum heat transfer is obtained.

Preferably the volume of the experimentation chamber 20 is at most 1 ml.

Figure 3 shows a part of a filtration device 30 to be used in combination with the experimentation assembly of the invention, e.g. according to figure 1.

The filtration device 30 has channels 31 with inlets 32 corresponding to the bores 5 in the main body 2 of the experimentation assembly 1 and a filter 33 in each channel 31.

The filtration device 30 and the assembly 1 are preferably used so that - after removal of the top cover plate of the experimentation assembly 1 when in horizontal position and removal of the associated sealing member(s) - said filtration device 30 can be brought against the top face of the main body 2, after which said system is reversed and the contents of the experimentation chambers 20 enters the channels 31 in the filtration device 30 and is filtered by the filters 33.

The channels 32 in the filtration device 30 have outlets 34. If the system further comprises a collecting device 40, e.g. as shown in figure 4, having collecting chambers 41 with inlets corresponding to the outlets of the filtration device 30 the filtered contents of the experimentation chambers can enter said collecting chambers 41.

The assembly 1 allows for the efficient use of a press device having multiple press members corresponding to the liners of the experimentation assembly for pressing said liners 6 into and/or out of the bores 5 of the main body 2.

As mentioned before the assembly 1 can be used preferably in combination with heating means, e.g for heating and thereby possibly evaporating a liquid content in the experimentation chambers 20 or for bringing a solid into solution which can the for crystals as it is cooled down.

The heating means can either be mounted in the main body 2 and/or cover plate(s) 12, 18 or be brought into contact with the main body 2 and/or cover plate(s) 12,18.

If evaporation of a part of the content of the experimentation chambers 20 is desired, it is preferred that the system further comprises a vapour discharge assembly 50 e.g. as shown in figure 5.

The assembly 50 comprises multiple hollow needle members 51, which are each adapted to be pierced through a sealing

member 11, 16 so that vapour discharges via said hollow needle 51.

As is shown in figure 5 the needles 51 are preferably upwardly directed and arranged to pierce through the sealing members 16 sealing the bottom face of the experimentation assembly 50 in horizontal orientation. This allows bringing the point of the hollow needles well above a liquid level in the experimentation chambers 20 so that vapour will escape through said needles 51.

It will be clear that the assembly 50 can also be used to drain a part of any liquid contents from the experimentation chambers.

In another embodiment a feed assembly is provided for feeding a substance into the experimentation chambers 20, said feed assembly comprising at least one hollow needle member adapted to be pierced through a sealing member. The introduction into the chambers 20 can be done from below or above.

For instance in the field of crystallisation experiments such a feed assembly allows for the introduction of an anti-solvent into the experimentation chambers.